

# **Firm collaboration and modes of innovation in Norway**

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# Two modes of innovation

## ▶ Hard science and technology

1. Linear model of innovation (Bush 1945, Maclaurin 1953)
2. Knowledge spillovers (Audretsch and Feldman 1996, Sonn and Storper 2008)
3. Key variables: R&D investment, human capital, links to scientific partners
4. Key skills: Know-why, know-what (Jensen et al. 2007)

## ▶ ‘Science, technology and innovation’ (**STI** mode) (Jensen, Johnson, Lorenz and Lundvall, 2007)

## ▶ Learning by doing

1. Regional innovation systems (Lundvall 1992, Cooke and Morgan 1998), industrial districts (Becattini 1987), learning regions (Morgan 1997), innovative milieux (Aydalot 1986)
2. Key variables: Interaction, social capital, organisations, institutions, markets
3. Key skills: Know-how, know-who (Jensen et al. 2007)

## ▶ ‘Doing, using and interacting’ (**DUI** mode)

# Two types of interaction in DUI mode

## ► Within supply-chain

1. With suppliers and customers
2. Close complementary bonds within supply chain
3. Clear economic purpose, joint aim of improving products
4. Contractual links
5. Externalities from specialisation (Marshall) or related variety (Frenken et al. 2007, Boschma and Iammarino 2009)

## ► Outside supply-chain

1. With other firms, such as competitors
2. Transfer of knowledge not the main purpose
3. Unintended knowledge spillovers may happen
4. Externalities from diversification (Jacobs), potential for excessive cognitive distance (Boschma 2005)

# The geography of STI and DUI

## ► STI mode

1. Costly search for knowledge requires purpose-built connections – global pipelines (Bathelt et al. 2004)
2. Analytical and codified knowledge travels well (Asheim and Gertler 2005)
3. Geographical distance not necessarily a problem
4. Top research centres often located far away

## ► DUI mode

1. Based on shared problems and experiences
2. Tacit knowledge
3. More frequent in industries with synthetic or symbolic knowledge base (Moodysson et al. 2008)
4. Local buzz (Storper and Venables 2004), informal interaction
5. 'Being there' (Gertler 1995)
6. Strong value-added of local cooperation

# Research questions

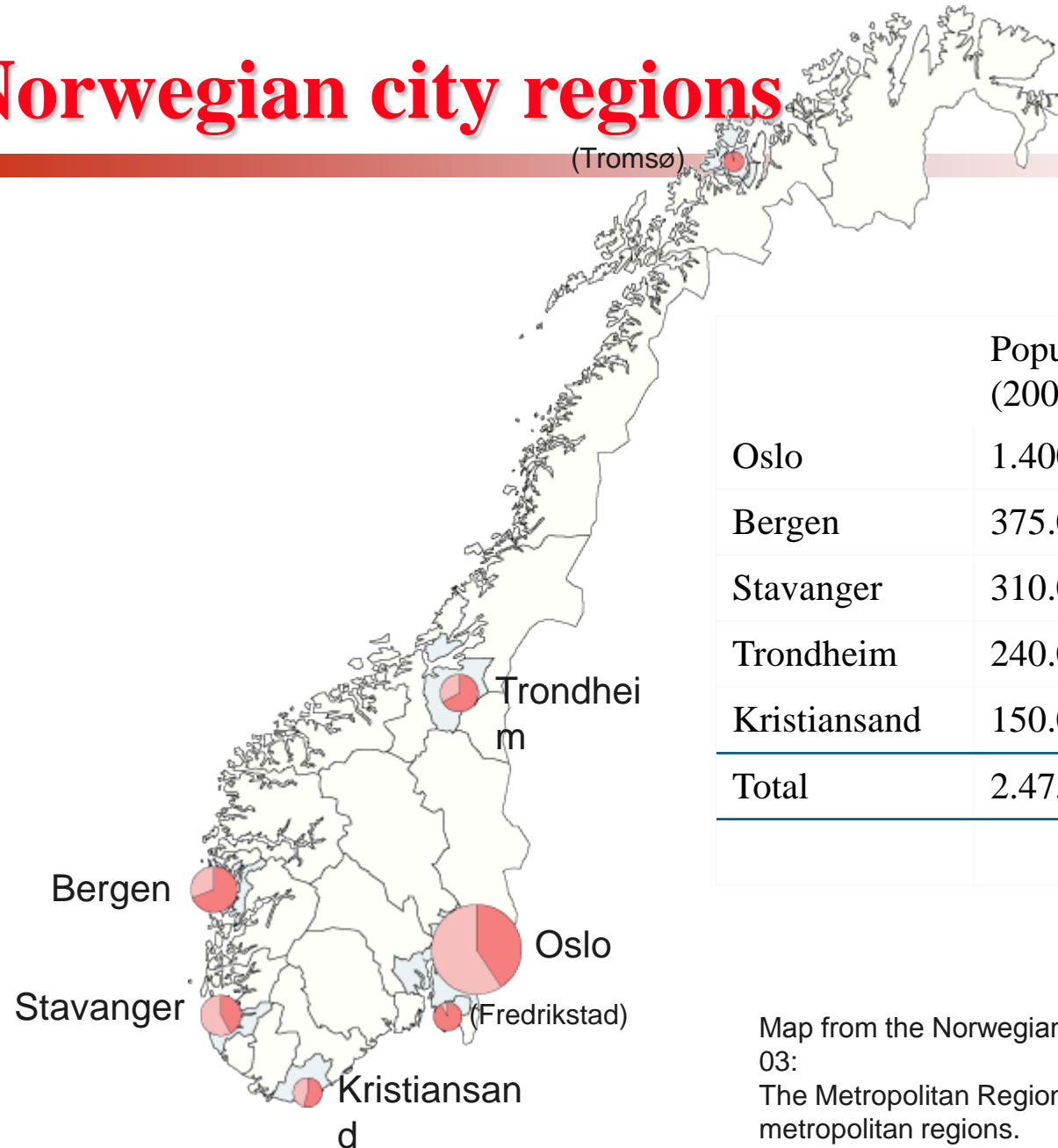
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- ▶ **How do DUI- and STI-modes of collaboration affect the innovative capacity of firms?**
- ▶ **Does it matter whether industrial and scientific partners are located nearby or at a distance?**

# The case of Norway

- ▶ **Small and relatively remote**
- ▶ **Population of around 4.5 million**
- ▶ **Performs poorly on traditional (STI-based) indicators of innovation (R&D investments, patenting)**
- ▶ **From a DUI perspective, insufficient agglomeration and the long distance between major cities is a drawback**
- ▶ **Yet high levels of productivity and growth**
- ▶ **Firms invest little in intramural R&D and frequently pursue collaborative innovation strategies (Fagerberg et al. 2009)**
- ▶ **Innovation policy increasingly focused on regions**
- ▶ **Main assets: Good institutions, high level of trust, solid endowments of human capital, open economy, rich**

# Norwegian city regions



	Population (2009)	Businesses > 10 empl	Sample
Oslo	1.400.000	4921	403
Bergen	375.000	1210	401
Stavanger	310.000	1282	400
Trondheim	240.000	901	300
Kristiansand	150.000	469	100
Total	2.475.000	8783	1604

Map from the Norwegian Government's white paper no. 31, 2002-03:

The Metropolitan Region Report: On the development of policies for metropolitan regions.

# Data

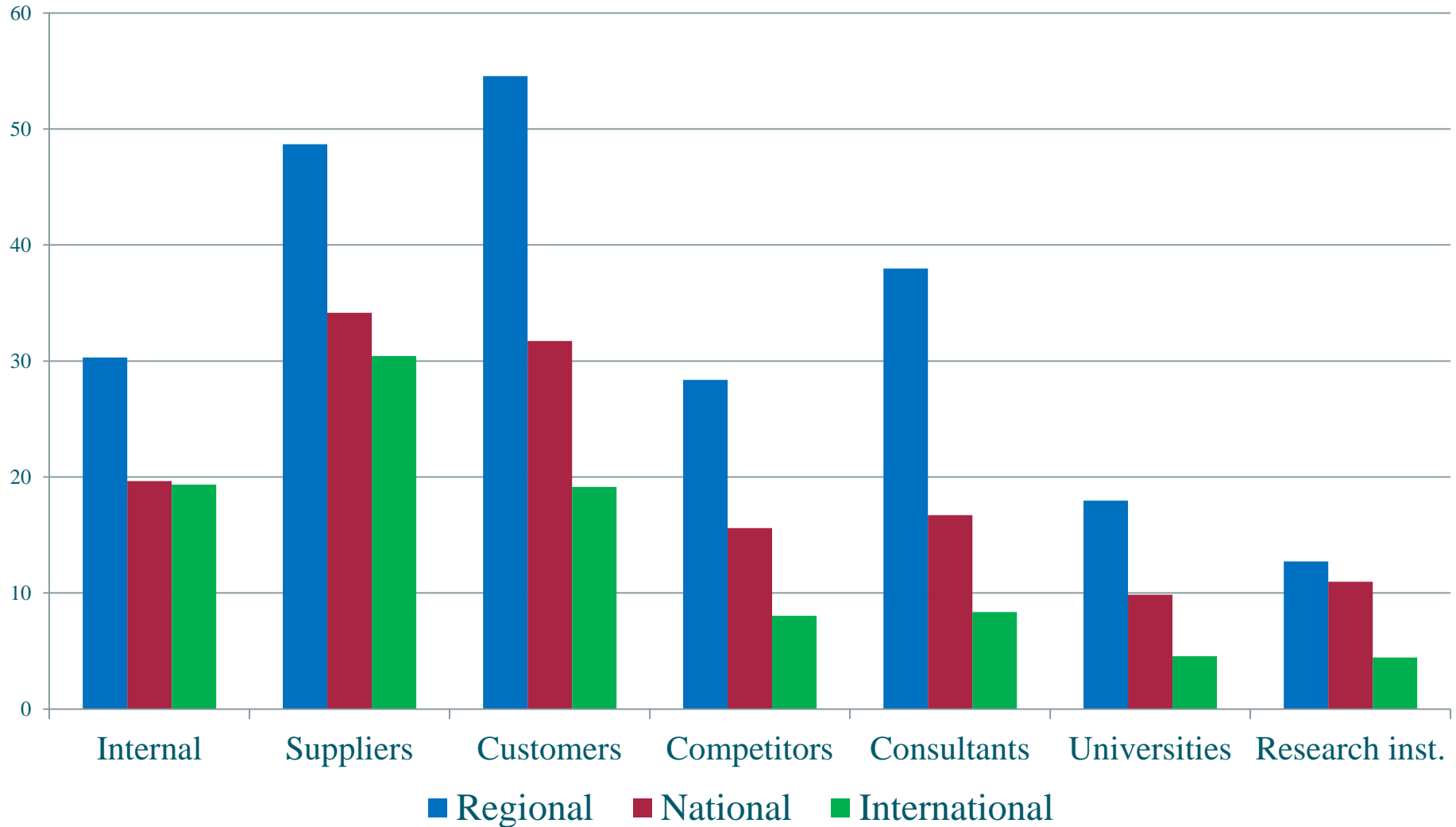
- ▶ **Tailor-made survey of firms with more than 10 employees in Norway**
- ▶ **Targeting the managers of those firms**
- ▶ **Conducted by telephone**
- ▶ **In the five largest urban agglomerations in Norway**
- ▶ **In the spring of 2010**
- ▶ **Examining**
  1. Innovation during the last three years
  2. The use of external partners in innovation processes
  3. The location of external partners used



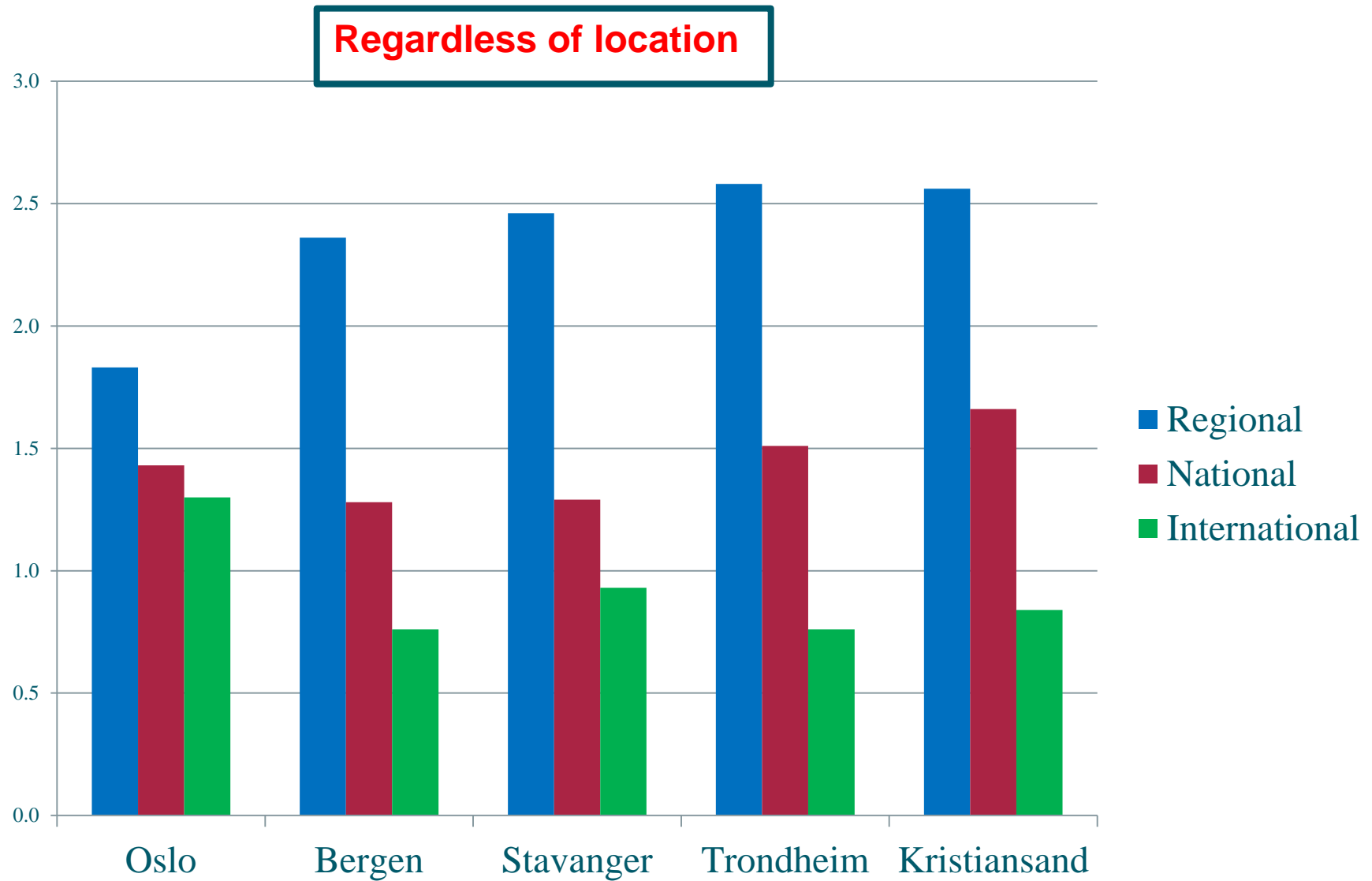
# Innovation in Norwegian city regions

(% yes)	Product		Process		N
	<i>Total</i>	<i>Radical</i>	<i>Total</i>	<i>Radical</i>	
Oslo	59.6 %	34.0 %	50.4 %	20.4 %	403
Bergen	46.4 %	25.1 %	42.4 %	16.5 %	401
Stavanger	54.0 %	33.8 %	46.8 %	18.8 %	400
Trondheim	52.3 %	29.0 %	48.7 %	19.7 %	300
Kristiansand	58.0 %	30.0 %	47.0 %	20.0 %	100
Total	53.4 %	30.5 %	46.9 %	18.8 %	1604

# Percent of companies using partner type



# Partners by city-region



# Innovation and collaboration with partner

	Product	New to market	Process	New to industry
<i>Within congl</i>	0.39** (0.12)	0.20 (0.13)	-0.02 (0.12)	0.10 (0.15)
<i>Suppliers</i>	0.39** (0.14)	0.33* (0.16)	0.76*** (0.14)	0.38* (0.19)
<i>Customers</i>	0.36** (0.13)	0.54*** (0.15)	0.03 (0.13)	-0.03 (0.17)
<i>Competitors</i>	-0.39*** (0.12)	-0.55*** (0.13)	-0.14 (0.12)	-0.09 (0.15)
<i>Consultancies</i>	0.15 (0.12)	0.18 (0.13)	0.16 (0.12)	0.03 (0.15)
<i>Universities</i>	0.30* (0.16)	0.53*** (0.15)	0.21 (0.15)	0.13 (0.18)
<i>Research inst</i>	0.26 (0.16)	0.20 (0.16)	0.26 (0.16)	0.79*** (0.18)

**DUI matters,  
suppliers – all  
innovation,  
customers –  
product  
innovation**

**STI matters,  
but mainly  
through  
collaboration  
with  
Universities  
(radical  
product and  
product  
innovation)**

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Logistic regression models, N = 1604. Controls: Sector, region, education, age, board memberships, ownership, size

# Innovation and collaboration with partner (II)

	Product	New to market	Process	New to industry
<i>Within congl</i>	0.39** (0.12)	0.20 (0.13)	-0.02 (0.12)	0.10 (0.15)
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**But DUI interaction outside the supply chain is detrimental for product innovation**

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Logistic regression models, N = 1604. Controls: Sector, region, education, age, board memberships, ownership, size

# Does geography matter?

Local tacit knowledge is not necessarily conducive to innovation

In DUI modes of collaboration within the supply chain, there is a big difference between collaborating with local and external partners

	Product	New to market	Process	New to industry
<i>DUI non-supp regional</i>	-0.20 (0.13)	-0.51*** (0.15)	-0.13 (0.13)	-0.08 (0.17)
<i>DUI non-supp non-regional</i>	-0.30* (0.15)	-0.13 (0.16)	-0.07 (0.15)	-0.01 (0.18)
<i>DUI supply-ch regional</i>	0.12 (0.12)	0.17 (0.13)	0.13 (0.12)	-0.03 (0.15)
<i>DUI supply-ch non-regional</i>	0.73*** (0.12)	0.72*** (0.14)	0.50*** (0.12)	0.42*** (0.16)
<i>Scientific regional</i>	0.23* (0.12)	0.40** (0.13)	0.20 (0.12)	0.14 (0.15)
<i>Scientific non-regional</i>	0.37** (0.14)	0.33* (0.14)	0.33* (0.13)	0.35* (0.16)

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Logistic regression models, N = 1602. Controls: Sector, region, education, age, board memberships, ownership, size

# Does geography matter? (II)

	Product	New to market	Process	New to industry
<i>DUI non-supp regional</i>	-0.20 (0.13)	-0.51*** (0.15)	-0.13 (0.13)	-0.08 (0.17)
<i>DUI non-supp non-regional</i>	-0.30* (0.15)	-0.13 (0.16)	-0.07 (0.15)	-0.01 (0.18)
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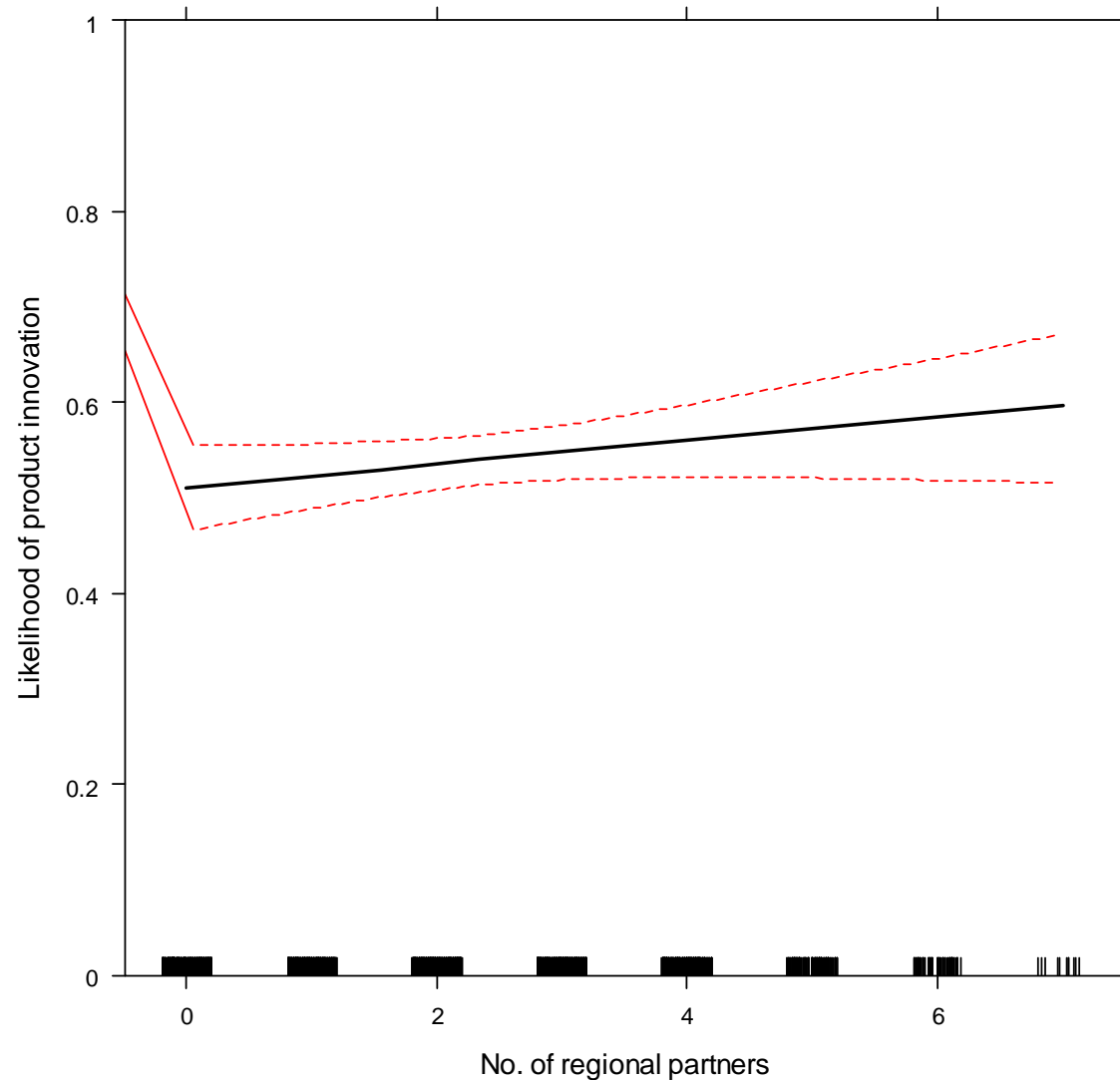
**STI stronger association with innovation**

**But local STI engagement matters more for product innovation and the association is weaker than of external STI engagement**

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

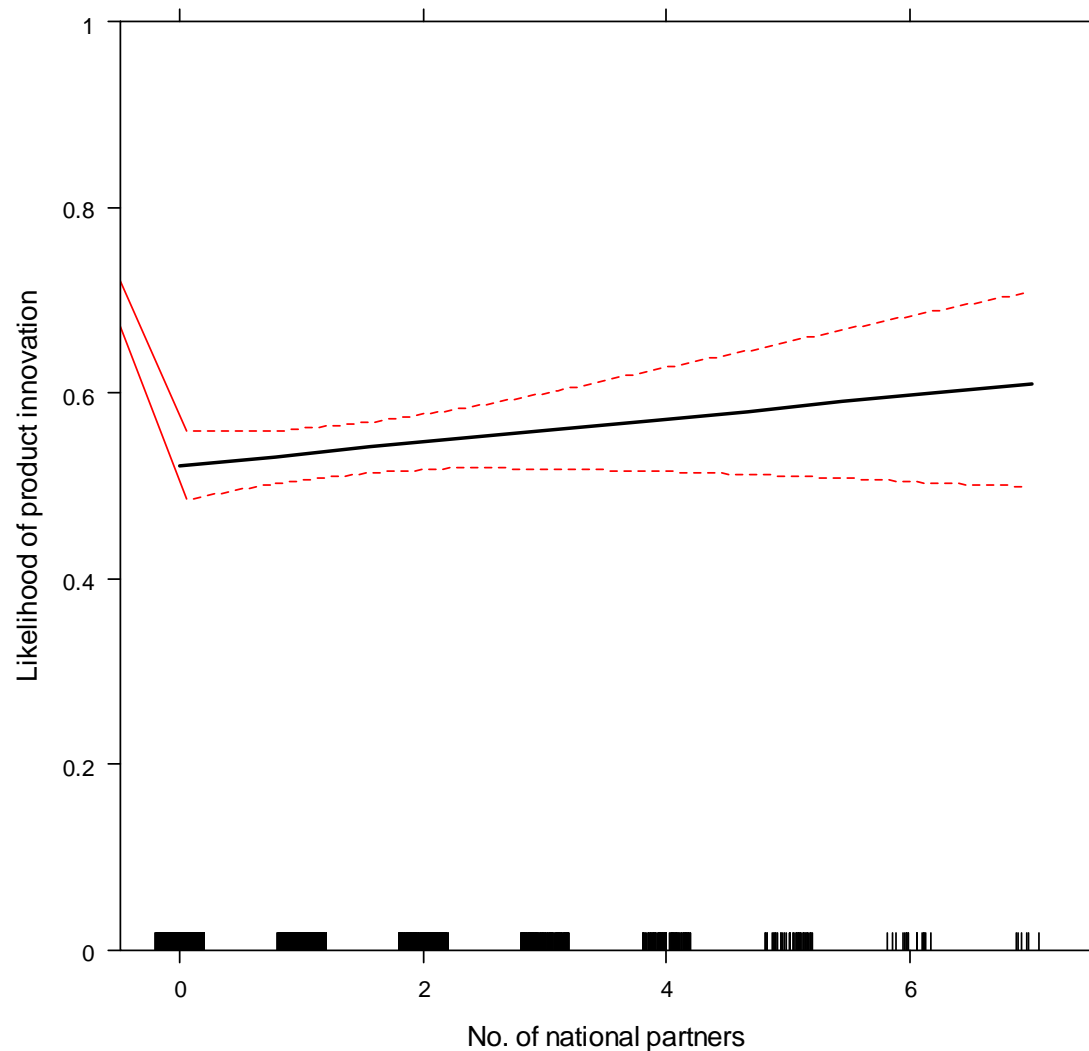
Logistic regression models, N = 1602. Controls: Sector, region, education, age, board memberships, ownership, size

# Regional cooperation and product innovation

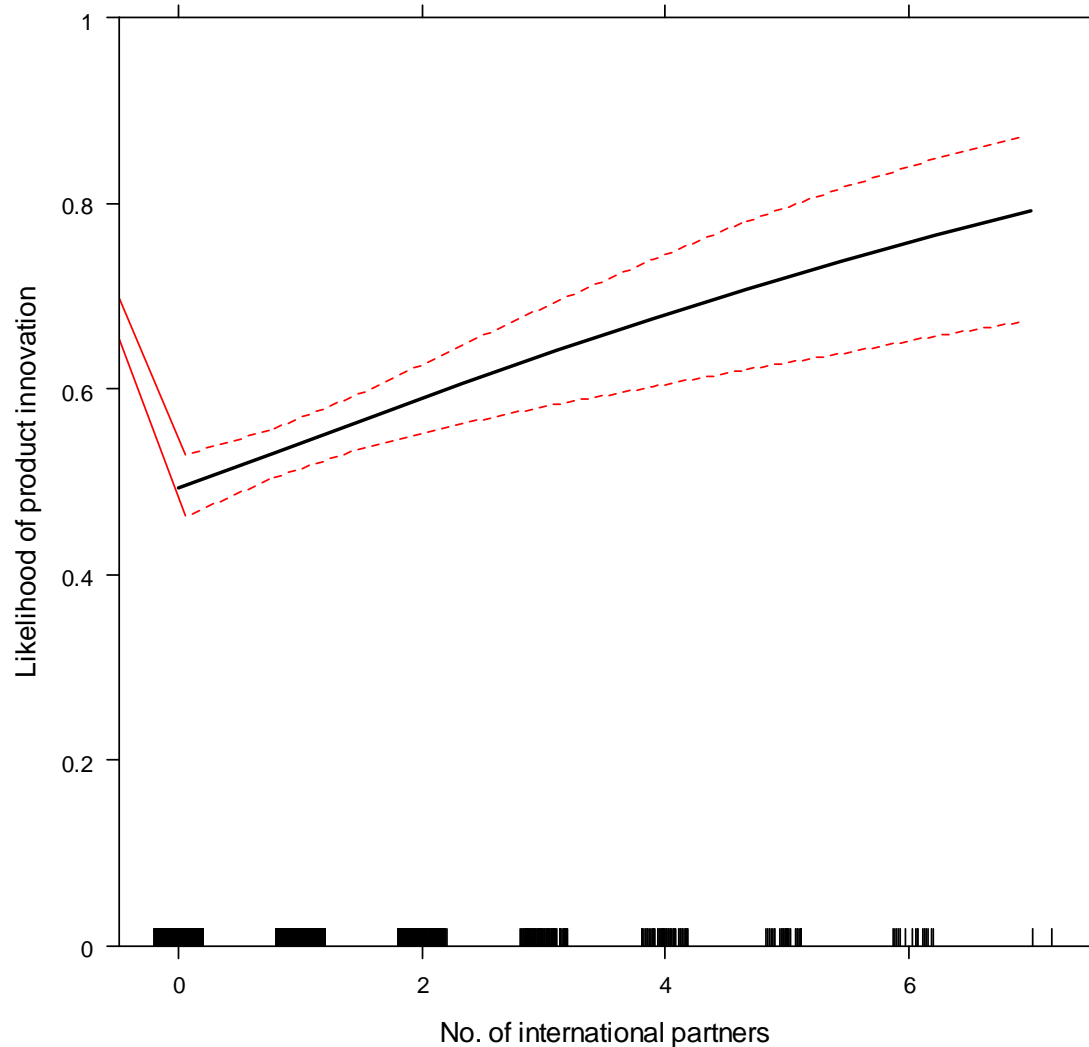




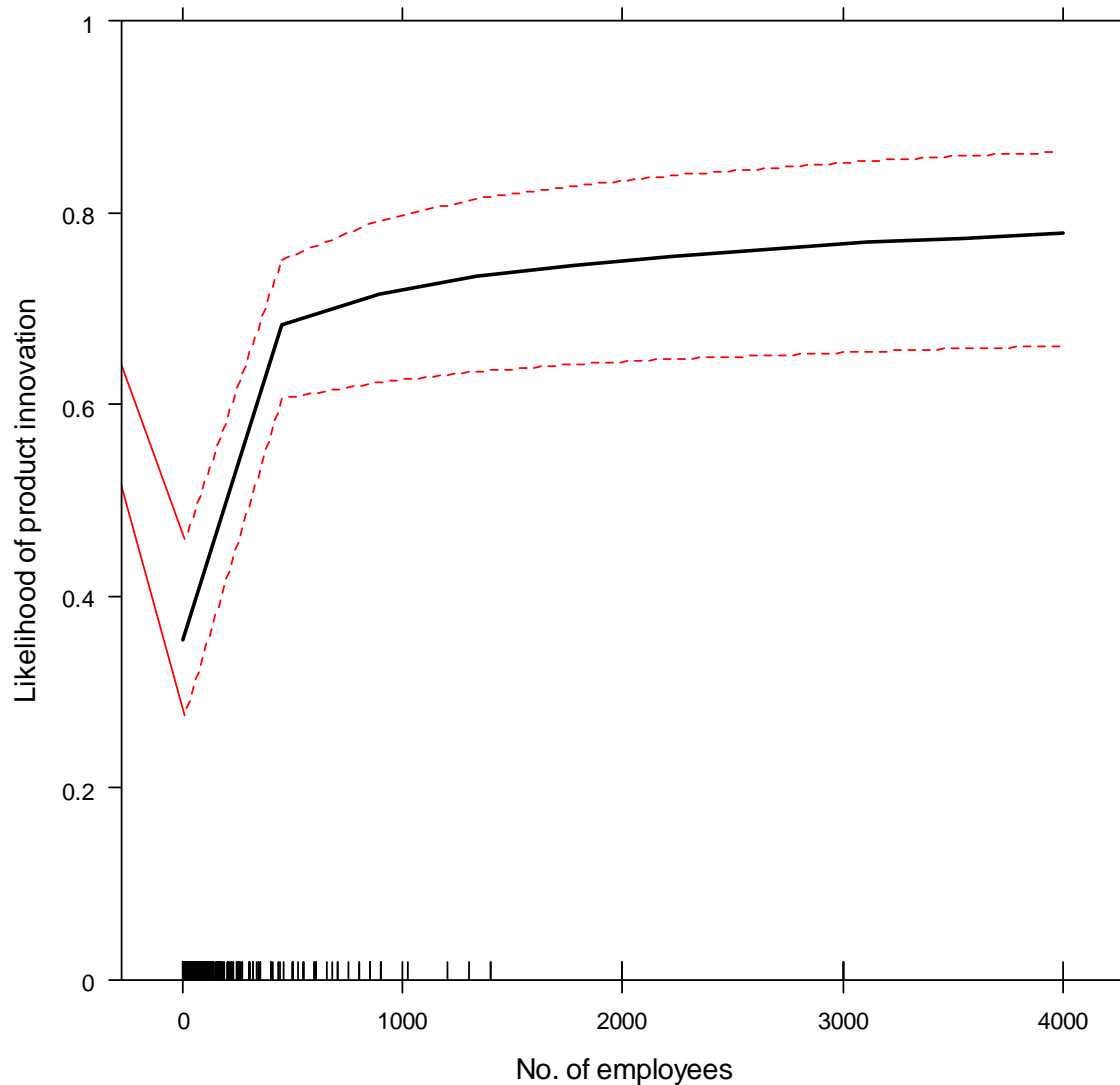
# National cooperation and product innovation



# Intl' cooperation and product innovation



# Company size and product innovation



# Conclusions

- ▶ **Both STI and DUI partnerships matter**
- ▶ **External cooperation seems to be a more important source of firm innovation than cooperation at close quarters**
- ▶ **Local interaction has a very limited effect on innovation – especially within DUI mode**
- ▶ **Cooperation with competitors can significantly harm firms' innovative ability**
- ▶ **Formal pipeline-type interactions key source of innovation – both in the STI and in the DUI mode**
- ▶ **Excessive cognitive proximity within small and homogeneous regions may be detrimental to innovation**
- ▶ **Heterogeneity among agents is important**
- ▶ **Innovation policy may have been wrong!**

# **Firm collaboration and modes of innovation in Norway**

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